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ABSTRACT

The study examined whether significant rural-urban differences still persisted in selected factors affecting a community's fertility level. The factors selected were education, occupational class, income, and the participation of women in the labor force. Tested was the hypothesis that the educational development, occupational class, economic status, and proportion of women working had direct negative effects on a community's fertility level; and these effects varied with place of residence. The 1970 census of Ohio's 88 counties was used in the analysis. The 31 SMSA's (Standard Metropolitan Statistical Area) in Ohio were treated as urban counties and the 57 non-SMSA's as rural counties. The t-test and path analysis were used to test the hypothesis. The first statistical finding from the t-test was that rural-urban differences were significant in each of the selected variables. The path analysis was then used to test the effects of these variables on fertility in rural and urban areas. No rural-urban difference was found in the relationship between fertility and occupational class. They were inversely related in both rural and urban areas. In rural areas, education had a direct negative effect, income had a positive effect, and women working had no effect on fertility. In urban areas, education and income had no direct effect on fertility, while women working had a positive effect on fertility. (Author/NQ)

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RURAL-URBAN DIFFERENCES IN FACTORS AFFECTING FERTILITY: A CASE STUDY OF OHIO[1]

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ABSTRACT. The main purpose of this paper is to determine whether significant rural-urban differences still persist in the selected factors affecting a community's fertility level. The factors selected are education, occupational class, income and the participation of women in labor force. The 1970 census of the 88 counties of Ohio are used in the analysis. The 31 SMSA's in Ohio are treated as urban counties and the 57 non-SMSA's as rural counties in the study. The first statistical finding from the t-test is that rural-urban differences are significant in each of the selected variables. The path analysis is then used to test the effects of these variables on fertility in rural and urban areas. No rural-urban difference is found in the relationship between fertility and occupational class. They are inversely related in both rural and urban areas. In rural areas, education has a direct negative effect, income has a positive effect, and women working has no effect on fertility. In urban areas, education and income have no direct effect on fertility, while women working has positive effect on fertility.

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Most sociologists agree that American society is increasingly undifferentiated -- that life styles, norms, and values among groups have lost and are still losing their distinctiveness. The consistent decrease in the sharpness of differentiation between and among major social statuses, categories and collectivities has been indicated in many studies (Williams, 1964). For example, the narrowing of differences between rural and urban areas is well-documented. However, as indicated by Schnore, the rural-urban differences in the United States today, while clearly declining, are still crucial; and the disappearance of substantial rural-urban differences is often grossly exaggerated (Schnore, 1966). The main purpose of this paper is to determine whether significant rural-urban differences still persist in selected factors affecting a community's fertility level. The 1970 census of 88 counties of Ohio is used in the analysis; and the primary concern is the fertility behavior and its factors as related to community structure. In other words, this study addresses itself to the influence that some macro-social structures have exercised upon community fertility levels.

On the basis of findings reported by previous studies, socio-economic status and the participation of women in the labor force are selected as the independent variables to explain fertility. Socio-economic status is further broken down into three components; education, income, and occupation. The indicators of the major factors of fertility therefore become: (1) Education, (2) Occupational Class, (3) Income, and (4) Women Working. An analysis using these four indicators will then be made to study the differences between rural and urban communities.

THEORY

Socio-economic Status and Fertility

Many demographic studies have dealt with the relationship between several indicators of socio-economic status and fertility. In modern Western societies, the typical pattern has been that the higher the family's socio-economic status, the lower the fertility it has. It has also been found that within the same society, regional differences in fertility levels are associated with the socio-economic development of communities. Some survey data in the United States have demonstrated that increases in socio-economic status mean increase in the proportion practicing contraception (Kiser, Grabill and Combell, 1968). There are also several studies which indicate that the traditional inverse relationship between socio-economic status and fertility observed in the United States for many years has diminished and tends to disappear. For instance , Mayer (1959) has attributed this factor to the general narrowing in class differences as a result of the general adoption of the middle class norm of the small family size spread out in the total population of the country, with the exception of some minority groups where high fertility is still prevalent.

Proportion of Women Working and Fertility

In western countries, women labor force participation has been one of the most impressive independent variables used to explain fertility performance. The inverse relationship between the labor force participation of women and the fertility ratio has been well documented in census data for Western Europe and the United States. Several research findings have supported this evidence. For example, Pratt and Whelton (1956) indicated that inverse relationship

between women working and fertility was observed in the Indianpolis study. Collver (1958) who studied several metropolitan areas, also had the same findings. However, there are also some investigations reporting contradictory findings. For example, based on 1963 Turkey data, Stycos and Weller (1967), controlling for urban-rural residence, education, and exposure to conception within marriage, found no relationship between women's working and family size.

Rural-Urban Differences in Influences of SES, Women Employment and Fertility

The higher rural than urban fertility in the United States has long been fully documented and recognized. However, most of the recent studies of fertility differentials in the United States show that group differences have either disappeared or are very small indeed. In a review of the explanation for the contraction of status as well as rural-urban differentials, Freedman (1962) suggested that two plausible explanations: (1) the use of contraception has spread through all strata, thus virtually eliminating the differential use of contraception as a basis of group differences; and (2) the inverse relationship between status and fertility in the past may have been largely due to the recent rural origin of lower status group. However in Beegle's study (1966), he found that relatively large rural-urban differences persisted in the United States in 1960 despite the well-documented narrowing of the usual fertility differentials.

In a study by Tarver (1969), it is indicated that the fertility of women increases directly with distance from the nearest metropolitan center. Other studies of the employment of urban wives have found that employment rates are higher in those areas with an industrial structure with heavy concentration of female jobs such as clerical occupations, light factory work and service jobs

(Bowen and Finegan, 1969; Cain, 1966).

So far, there has been relatively little research dealing with the factors affecting fertility with control of rural-urban residence. The four factors mentioned previously, namely, education, occupation, income and women working, are very much likely to have different degrees of influence on fertility in different residence locations. This study is designed to examine the existence of these differences.

THE HYPOTHESIS

The hypothesis of this study, based on the previous discussion, is that the educational development, occupational class, economic status, and proportion of women working have direct negative effects on a community's fertility level; and these effects vary with place of residence.

TEST OF HYPOTHESIS

Data on five socio- demographic variables are taken from the 1970 census data of the 88 counties in Ohio. The dependent variable is fertility, and the four independent variables are education, occupation, income, and women working. These variables are interpreted by the operational definitions as follows:

Fertility Ratio: Children ever born per 1,000 females ever married age 35-44 years (Cummulative Fertility Ratio).

Education: Median school years completed for persons 25 and over.

Occupational Class: Percent white collar class in labor force.

Income: Median income in dollars of the county.

Women Working: Percent females age 16 and older in the labor force.

As of 1970, there are 31 SMSA's in Ohio. They are treated as urban counties and 57 non-SMSA's as rural counties in the study.

In order to test the hypothesis mentioned previously, statistical techniques such as t-test and path analysis are used in this study. The hypothesized path model is shown in Figure 1, in which education and occupation are treated as exogenous variables; that is, they are not determined by any other variables considered in the model. The model itself is recursive: that is, the causal flow all move in one direction with no untested or reciprocal links among the endogenuous variables.

(Figure 1 about here).

RESULT AND DISCUSSION

The first finding from the statistical data gathered is that a difference appears between the rural and the urban counties. Table 1 shows the mean values of rural/urban educational level, percent white collar class in labor, income, percent women working, and fertility together with the t values associated with each variable. Using t-test to decide whether the rural-urban difference of each variable is significant or not, the results show that all differences are significant at $\alpha = 0.01$ level.

(Table 1 about here).

The most significant rural-urban differences as shown in Table 1 is income ($t = 7.34$); the mean values are $8,580 in rural and $10,338 in urban areas. Percent of white collar class is also much higher in urban than in rural. Fertility ratio is higher in rural than in urban. Educational attainment is slightly higher in urban counties. Note that the standard deviation of educational

attainment is higher in rural than in urban (11.62±0.78 years in rural and 11.98±0.35 years in urban). This further reveals some differences between rural and urban areas. In urban areas, there are usually more educational opportunities than in rural areas; therefore, urban people tend to have higher and more uniformly distributed educational level. Percent of women working are about the same with urban slightly higher (38.79% vs. 36.01%), but the t-test still indicates a significant difference at 1% level.

The matrices of zero-order correlations of the five variables are shown in Table 2 and Table 3 for rural and urban counties, respectively. In both cases, occupational class shows the most significant negative correlation coefficients with fertility: -0.5074 in rural and -0.5455 in urban. Next to occupation, education is the only variable significantly correlated with fertility in rural areas (-0,1120). Both income and women working have negligible positive correlation coefficients with rural fertility (0.0870 and 0.0306, respectively). In urban areas, on the other hand, the correlation between education and fertility is negligible (-0.0237), while the correlation between income and fertility is significantly negative (-0.1867). These findings indicate that occupation and income play their important roles in urban while occupation and education play theirs in rural areas. Note also that the correlations among education, income and women working are stronger in rural than in urban areas. This can be explained as that urban areas are usually more heterogenous than rural areas and thus the correlations among these variables (education, income, and women working) are lower in urban areas due to the presences of other factors

such as degree of industrialization, job or job training opportunities, education opportunities and so on.

(Table 2 and Table 3 about here).

At this point, some of the hypothesized inverse relationships between fertility and the four independent variables seem to be questionable. Nevertheless, knowledge of these individual correlations can not fully explain the effect of these variables on fertility; and path analysis technique is needed to access the network of the hypothesized relationships and to isolate the direct influence of the variables on the fertility ratios.

The path coefficients and the recursive equations for the rural and urban fertility model are shown in Figure 2 and 3, respectively. A comparison of the coefficients of these two models is given in Table 4. If the standard deviation of a path coefficient is larger than the coefficient then the path is considered to be insignificant. Insignificant paths are indicated by a "*" in the table and by a dotted line in the figures.

(Figure 2 and 3 about here).

(Table 4 about here).

The Rural Fertility Model (Figure 2.)

The rural model shows that both education and occupation have a significant direct negative effect on fertility (P51 = -.2526 and P52 = -.5355) as predicted. Income, on the contrary, has a positive direct effect on fertility (P53 = .4519). The income level is highly influenced by education (p31 = .7868) but is not

associated with occupation (P32 = -.0089 ± .107). Direct effect of women working on fertility is also insignificant (P54 = -.0143 ± .131). The effect of occupational class on women working is insignificant (P42 = .0056 ± .113).

Of the variations of fertility, 34 percent are explained by this rural model; and 61 percent of the variations of income, and 55 percent of that of women working are explained by the model. These R square values are considered very good in path analysis studies. The estimated correlation matrix from path coefficients and differences between original and estimated correlations are shown in Table 5. The predictability and internal mathematical vadility of the model are quite good; and it seems that this model for 1970 rural fertility repsents the actual correlations among the variables.

(Table 5 about here).

The Urban Fertility Model (Figure 3)

Figure 3 shows that direct effects of education and income on fertility disappeared in the urban areas. Percent of white collar occupation shows a strong negative effect on fertility (P52 = -.8267). Women working shows a positive direct effect on fertility (P54 = .3504). Both education and occupational class have a positive effect on income (P31 = .3718 and P32 = .4119) and women working (P41 = .5104 and P42 = .3471).

The urban fertility model explains 43 percent of the variations of fertility, 46 percent of that of income, and 56 percent of women working. This model is therefore as good as, if not better than, the rural fertility model as

far as the R square values are concerned. The estimated correlations and differences between estimated and observed correlations are shown in Table 6. The residuals again show that the model represent actual correlations among the variables.

(Table 6 about here).

Comparison of Rural and Urban Fertility Models

From the previous description, the two models in Figure 2 and Figure 3 show clear rural-urban differences in their fertility behavior. In rural areas, education has a direct negative effect on fertility. However, this relationship does not exist in urban areas. Traditionally, because of the different attitudes and practices concerning birth control among people of different educational background, many studies showed the inverse relationship between education and fertility (for example, Kiser et al, 1968; also see Hawthorn, 1970:102, and Stockwell, 1968:117-121). Although not in urban areas, this relationship still persists in Ohio rural areas in 1970.

In a analysis of the United States fertility trends using 1965 data, Westoff and Westoff (1971) found that the inverse relationship does not exist, but with a gradual adoption of lower fertility by those in the less educated groups. A study of 1960 United States census suggested that the negative relationship between education and fertility is still prevalent but may reflect different patterns of child-spacing rather than complete fertility (Kupinsky, 1971). Some studies, for example Mayer (1959) as mentioned before, suggested th

that this relationship in the United States has diminished and tends to disappear (also see Wrong, 1958). However, no study has ever shown the different patterns of the effect of education on fertility based on rural-urban residence differences. The fact that different rural-urban patterns exist in Ohio can be explained as that urban people are more aware of the cost of child-bearing, the problems associated with over-population, and the techniques of birth control in despite of their educational background -- and therefore direct effect of education on fertility disappears inurban areas.

The relationship between occupation and fertility has been demostrated by many studies of fertility and social class (for example in Grabill et al, 1958 and Kiser et al, 1968). The result of this study shows that the effect of occupational class on community's fertility is the highest among all the variables. The influence is negative in both rural and urban areas (P52 = -.5355 in rural and -.8267 in urban). This indicates that no matter whether rural or urban, white-collar-class people tend to have less children than blue-collar workers or farmers.

The relationship between income and fertility has been very controversial. The most widely and favorably known has been the "income determination" hypothesis formulated by Becker (1960). He suggested that an increase in income would increase both the quality and quantity of children. This proposition is supported by several studies (Freedman, 1965; Stys, 1957 and Dejong, 1965). However, contradictory findings are also reported (Blake, 1967 ; Weintraub, 1962; and Adelman, 1963). In the rural model of this study, income shows a strong positive effect on fertility (P52 = .4519). Although this study does not measure the quality of children, yet the high correlation between income and education

(P31 = .7868) seems to indicate that higher income would increase both the quality and quantity of children in rural areas. In urban areas, however, the pattern is completely different: there seems to be no association between income and fertility at all. This rural-urban difference can be interpreted as that life in rural areas is more conservative and rural people would enjoy having more children if they can afford -- hence the fertility level is higher if the income is higher. In urban areas, however, people with higher income usually means better leisure time programs and a wide variety of social life. There are also ecological and psychological factors in urban life which rural people do not encounter. Therefore, the traditional effect of income on fertility persists in rural areas only.

As indicated in the earlier part of this paper, the inverse relationship between women working and fertility is well documented. However, this relationship has also been denied in many studies of developing countries (which usually means poor and agricultural) such as the study of Turkey mentioned previously. In the study by Federici (1968) of Italy, he found that the relationship between women working does not exist in the south (the south Italy is agricultural and poor) but does exist in the north (more urbanized part of Italy). There are several other studies which have indicated this rural-urban differential (see Hawthorn, 1970: 103-105). A close inspection of the literature leads to the conclusion that although the direct effect of women working on fertility is not always negative, there have not been any previous reports in which the relationship is positive.

The data compiled for this study distinguish between rural areas, where the relationship disappears, and urban areas, where it exists. However, it is

surprising to find that the relationship is positive in urban rather negative as usually reported. As indicated by Hawthorn (1970), in lower social economic groups, women working seems possible to worsen the conjugal relationship, and this could cause poorer family planning success. Since the data obtained for this study are macroscopic (that is, at the community level and not the individual level), it is impossible to investigate any further at this point. In future studies, it might be worthwhile to analyze the differential in the effect of women working on fertility among different socio-economic classes in urban areas.

CONCLUSION

From the previous discussions, it can be concluded that crucial rural-urban differences in fertility behavior still exist in Ohio as of 1970. These difference can be summarized as follows:

(1) Income, percent white collar labor, educational attainment, and percent of women working are higher in urban than in rural areas.

(2) Variations (standard deviations) of education is higher in rural. Variations of fertility is higher in urban.

(3) No rural-urban differences are found in the relationship between occupation class and fertility. They are inversely related in both rural and urban areas.

(4) In rural areas, education, income and women working still persist their traditional relationships with fertility; that is, education has a direct negative effect; income has a positive effect, and women working has no effect on fertility.

(5) In urban areas, all traditional relationships disappear ; education and

income have no direct effect on fertility al all -- a result of thoroughly diffusion and acceptance of the family planning concept and birth control techniques in all social classes partly because of more costly and various social life in urban areas.

(6) Women working in urban areas is found to have a positive effect on fertility; no record have ever shown this kind of relationship between women working and fertility. Further investigations using individual data instead of community—level census are needed to determine whether this positive relationship is due to the different behaviors in different socio-economic classes.

Overall, place of residence still appears to help explain the differences in fertility performance on macro-sociological level. However, as the population continues to become highly urbanized and as socio-economic differences are further diminished, rural-urban differences in fertility will doubtlessly continue to narrow. When this happens, the rural-urban differences in factors affecting fertility will not be meaningful any more; and the explanation of fertility differential will then rely on different individual level.

Variable	Rural (n_1=57) Mean	S.D.	Urban (n_2=31) Mean	S.D.	t-Test	Significant?
Education (Years)	11.62	0.78	11.98	0.35	t=2.97>t'=2.68	Yes
Occupation (% White Collar)	34.84	4.74	42.40	6.27	t=5.83>t'=2.73	Yes
Income (Dollars)	8580	1156	10338	1025	t=7.34>t'=2.71	Yes
Women Working (In %)	36.01	5.42	38.79	4.01	t=2.73>t'=2.72	Yes
Fertility (/1000 f.)	3272	259	3078	275	t=3.23>t'=2.72	Yes

$$t = \frac{\overline{y1} - \overline{y2}}{S_1^2/n_1 + S_2^2/n_2}$$

$$t'(\text{adjusted}) = \frac{t_1 \cdot S_{1/n_1}^2 + t_2 \cdot S_{2/n_2}^2}{S_{1/n_1}^2 + S_{2/n_2}^2} = \frac{t_1 S_{\bar{y}_1}^2 + t2\, S_{\bar{y}_2}^2}{S_{\bar{y}_1}^2 + S_{\bar{y}_2}^2}$$

Where: $\overline{y1}$ = rural mean, $\overline{y2}$ = urban mean, S_1 = rural s.d., S_2 = urban s.d., n_1 = rural sample size, n_2 = urban sample size, $t_1 = t_{n_1, \alpha=0.01}$, and $t_2 = t_{n_2, \alpha=0.01}$.

TABLE 1 MEAN, STANDARD DEVIATION, AND t-VALUES OF THE FIVE VARIABLES, OHIO 1970

	Education	Occupation	Income	Women Wk.	Fertility
Education	1.0	0.3788	0.7834	0.7440	-0.1120
Occupation	0.3788	1.0	0.2891	0.2866	-0.5047
Income	0.7834	0.2891	1.0	0.8548	0.0870
Women Work.	0.7440	0.2866	0.8548	1.0	0.0306
Fertility	-0.1120	-0.5047	0.0870	0.0306	1.0

TABLE 2 ZERO-ORDER CORRELATIONS, OHIO RURAL COUNTIES, 1970

	Education	Occupation	Income	Women Wk.	Fertility
Education	1.0	0.4952	0.5757	0.6823	-0.0237
Occupation	0.4952	1.0	0.5960	0.5999	-0.5455
Income	0.5757	0.5960	1.0	0.6419	-0.1867
Women Work.	0.6823	0.5999	0.6419	1.0	-0.0468
Fertility	-0.0237	-0.1867	-0.5455	-0.0468	1.0

TABLE 3 ZERO-ORDER CORRELATIONS, OHIO URBAN COUNTIES, 1970

Path	Rural	Urban
Educat'n-Income, P31	0.7868(±0.179)	0.3718(±0.211)
Occupa'n-Income, P32	-0.0089(±0.107)*	0.4119(±0.168)
Educat'n-Wmn.W., P41	0.7418(±0.176)	0.5104(±0.217)
Occupa'n-Wmn.W., P42	0.0056(±0.113)*	0.3471(±0.157)
Educat'n-Fert. , P51	-0.2526(±0.226)	0.1495(±0.253)*
Occupa'n-Fert. , P52	-0.5355(±0.131)	-0.8267(±0.177)
Income -Fert. , P53	0.4519(±0.131)	-0.0050(±0.177)*
Wmn. W. -Fert. , P54	-0.0143(±0.131)*	0.3504(±0.177)

Note: "*" Indicates insignificant path coefficient.

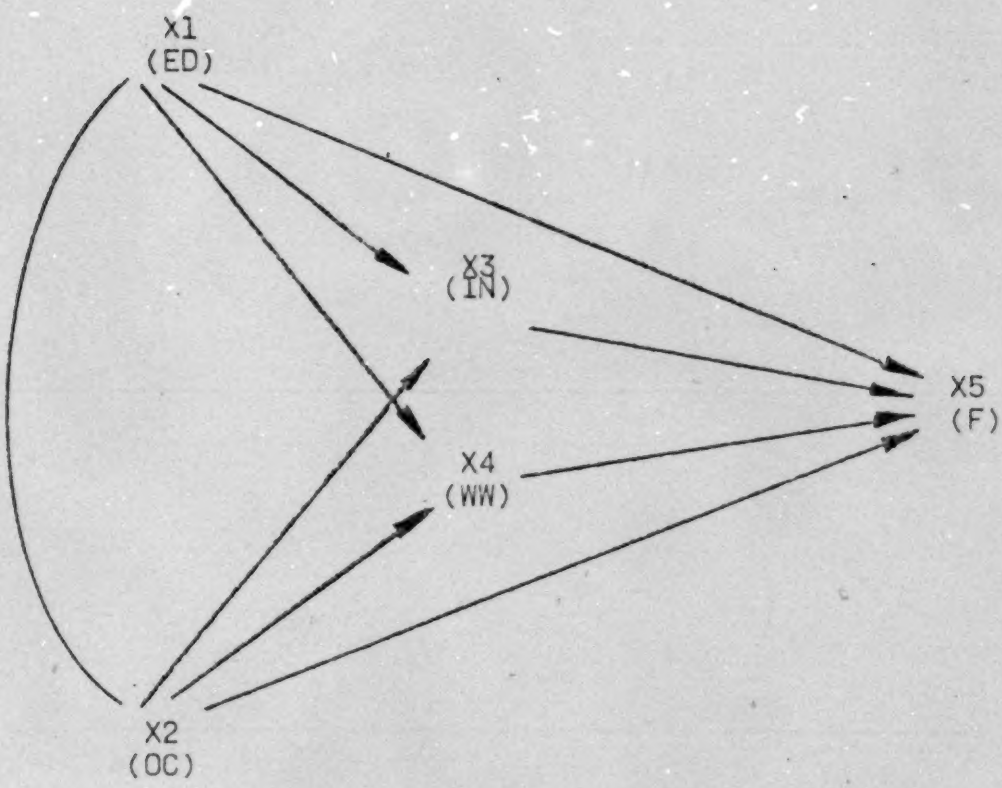
TABLE 4 PATH COEFFICIENTS OF THE FERTILITY MODELS

	X1	X2	X3	X4	X5
X1(Education)	1.000	0.379	0.783	0.774	-0.112
X2(Occupation)	0.000	1.000	0.289	0.287	-0.505
X3(Income)	0.208	-0.307	1.000	0.583	0.091
X4(Women Working)	0.000	0.000	-0.272	1.000	-0.092
X5(Fertility)	0.000	0.000	0.004	-0.123	1.000

TABLE 5 ESTIMATED CORRELATIONS FROM PATH COEFFICIENTS (ABOVE THE DIAGONAL) AND DIFFERENCES BETWEEN OBSERVED AND ESTIMATED CORRELATIONS (BELOW THE DIAGONAL) FOR OHIO RURAL COUNTIES, 1970

	X1	X2	X3	X4	X5
X1(Education)	1.000	0.495	0.576	0.682	-0.024
X2(Occupation)	0.000	1.000	0.596	0.600	-0.545
X3(Income)	0.000	0.000	1.000	0.501	-0.236
X4(Women Working)	0.000	0.000	-0.141	1.000	-0.046
X5(Fertility)	0.000	0.000	-0.049	0.001	1.000

TABLE 6 ESTIMATED CORRELATIONS FROM PATH COEFFICIENTS (ABOVE THE DIAGONAL) AND DIFFERENCES BETWEEN OBSERVED AND ESTIMATED CORRELATIONS (BELOW THE DIAGONAL) FOR OHIO URBAN COUNTIES, 1970



X1 (Education) = e1

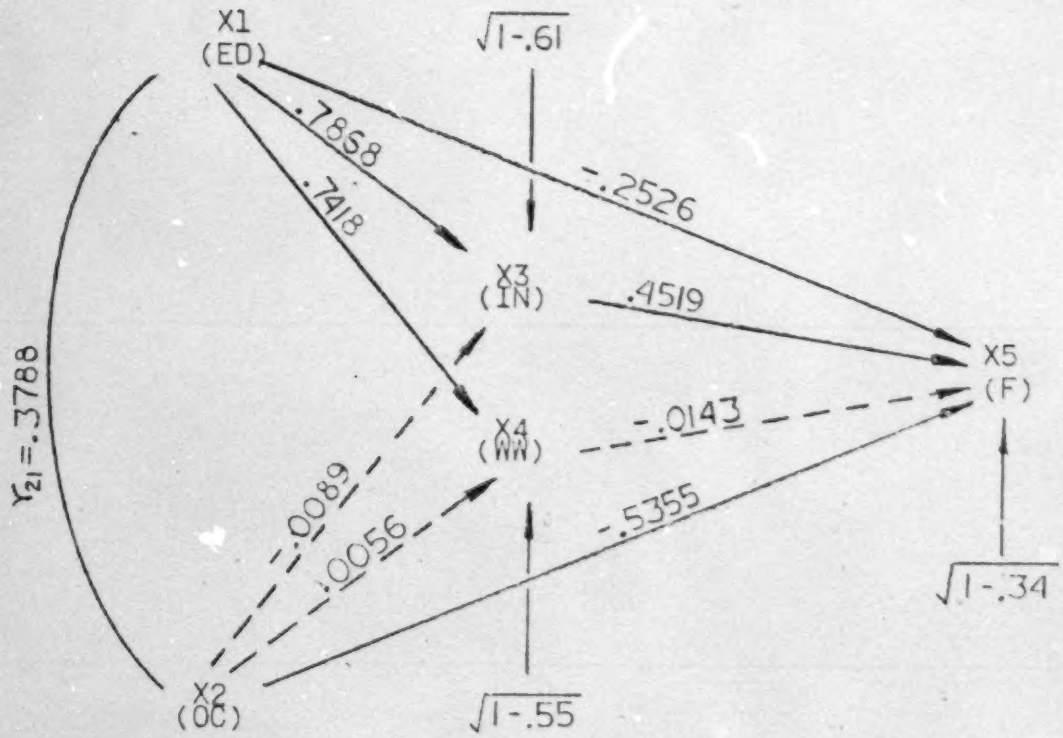
X2 (Occupation) = e2

X3 (Income) = (P31) X1 + (P32) X2 + e3

X4 (Women Work.) = (P41) X1 + (P42) X2 + e4

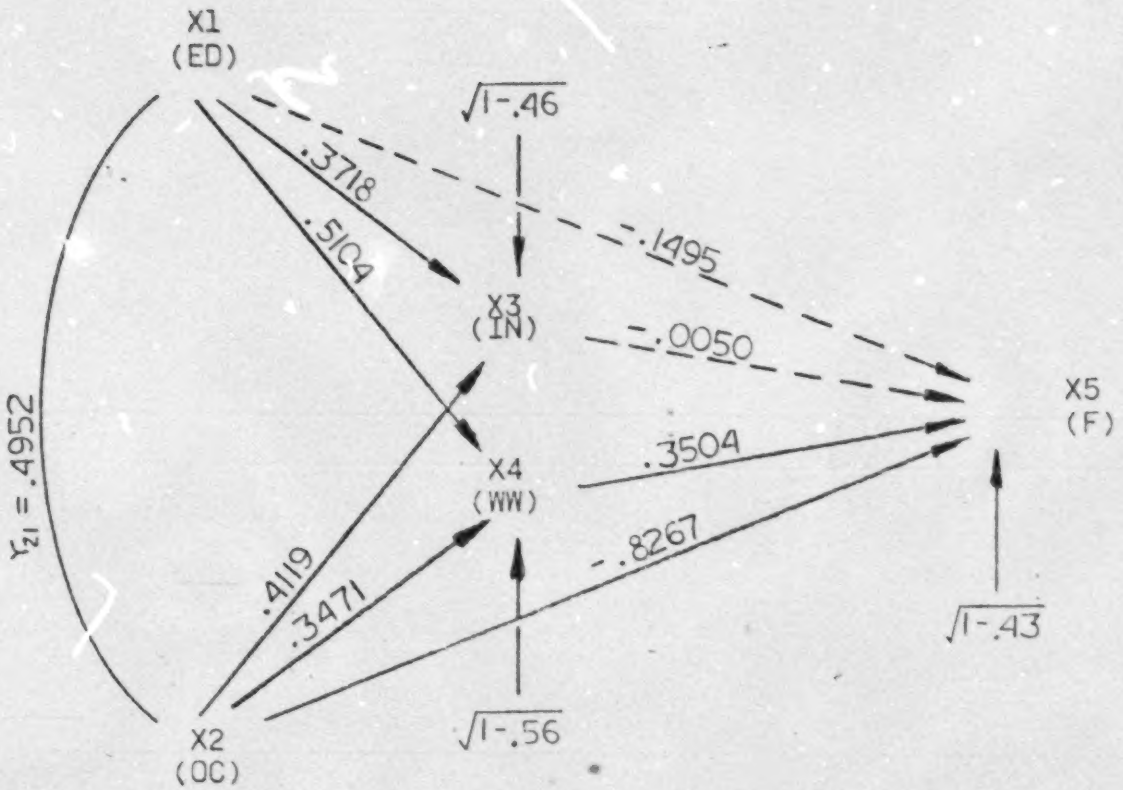
X5 (Fertility) = (P51) X1 + (P52) X2 + (P53) X3 + (P54) X4 + e5

Figure 1: Postulated Structural Path Diagram for Ohio Fertility



Where:
X1 (Education) = (1.0) e1
X2 (Occupation) = (1.0) e2
X3 (Income) = (.7868) X1 + (-.0089) X2 + (0.7) e3
X4 (Wmn. Wrk.) = (.7418) X1 + (.0056) X2 + (0.675) e4
X5 (Fertility) = (-.2526) X1 + (-.5355) X2 + (.4519) X3 + (-.0143) X4 + (.81) e5

Figure 2: Rural Fertility Model, Ohio



Where:
X1 (Education) = (1.0) e1
X2 (Occupation) = (1.0) e2
X3 (Income) = (.3718) X1 + (.4119) X2 + (0.79) e3
X4 (Wmn. Wrk.) = (.5104) X1 + (.3417) X2 + (0.667) e4
X5 (Fertility) = (.1495) X1 + (-.8267) X2 + (-.0050) X3
+ (.3504) X4 + (.822) e5

Figure 3: Urban Fertility Model, Ohio

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